AMSAT SATELLITE REPORT

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Editor: Vern Riportella, WA2LQQ
Contr. Editor: Bob Nickels, KEØT
Managing Editor: Bob Myers, W1XT

Intel IC Donation Eases Phase III Costs

One of the largest integrated circuit houses in the world, Intel, of Sunnyvale, California recently made a major donation of ICs to AMSAT for use with the Phase III satellite ground command stations. The type 2141L static RAMs (Random Access Memories) were accepted on behalf of AMSAT by John Fail, KL7GRF/6 at Intel's Tarzana, California office 29 Jan. The donation of 400 of these RAMs is valued at nearly $4000! The 4K X 1 static RAMs are extraordinary in that they feature 120 nano second access times and consume far less power than similar devices.

Carl Stevenson, WA6VSE/Ø, was instrumental in developing the gift to AMSAT. Carl, who is Managing and Technical Editor of Communications Magazine, established contact with Intel on AMSAT's behalf and managed the negotiations.

On behalf of its 5,000 members around the world, AMSAT expresses its sincere appreciation to the Intel Corporation for its generosity and simultaneously extends thanks to WA6VSE and KL7GRF for their productive efforts. The incorporation of this valued hardware into the ground control system goes a long way to assuring the timely integration of the stations required for successful operation of the new Phase IIIB satellite this summer.

John, KL7GRF (left), accepts donation to AMSAT of 400 memory chips from Kieth Beckwith of Intel Corp.

UoSAT Camera Turned On

AMSAT UK Secretary Ron Broadbent, G3AAJ, announced on Sunday, 14 Feb., that the CCD camera aboard UoSAT had been turned on for evaluation and test. The test period was expected to last for several days at least after which a determination would be made regarding going ahead with the CCD interface boards the user community has awaited.

Reckon Robot Speed To 45 WPM

G3IOR and others in the UK and Europe have estimated that the robots associated with Radio 5 and 7 have an adaptive speed range of from 12 to 45 words per minute by actual measurement. The Russians had previously indicated the speed-adaptive abilities of the robots but had not specified a range.

XF4 DXpedition Had Satellite Capability

At press time *ASR* had received reports from XE1TU that the DXpedition to Revillagigedo included equipment and orbital predictions to allow satellite operation from that rare island. XF4 qualifies as a DX country under the present DXCC rules. Station XF4MDX is located approximately 600 km west of the Mexican coast in the Pacific and north of FO8 (Clipperton). The operation was scheduled to be active from Saturday, 13 Feb. through Tuesday, 16 Feb., according to David Liberman, AMSAT Mexico President who provided much of the technical data required by the promoters of the DXpedition for the anticipated satellite activity. AMSAT members were apprised of this rare DX opportunity on the Sunday Nets, 14 Feb., by NCS KEØT.

At presstime two Californians had managed to work XF4MDX. N6DD and W6XN were the only ones acknowledged by the DX station despite the fact that many other stations were calling many of which were considerably stronger than XF4MDX himself.

ASR *At One: A Look Back; The Road Ahead*

With this issue *ASR* begins its second year of publication. As is customary with birthdays, we will take a moment for reflections and anticipations.

ASR began with about 100 readers most of whom were active producers of goods and services for AMSAT. After a year the roll has swelled to 500 and includes many in the active "user" community, amateur "officialdom," government and other circles. One gets the feeling of a ground-swell of interest propelled in part by UoSAT and the new RS birds.

The goal of providing a frequent, unifying, documentary vehicle for the "doers" has been achieved. Beyond that, the availability of current information in a highly readable form seems to have the bonus effect of encouraging more "users" to become "producers"; a healthy sign!

A couple of *ASR's* early features have been scrapped. For example, the "Horizon" feature was an early casualty. On the other hand, the utility of the orbital data in *ASR* has proven strong and very popular. The "Spotlight" feature continues after having featured many of the "doers" in the organization. On balance, however, the cost of communications has been reflected by the overall bias in coverage by this feature towards W/K stations. Efforts to broaden the spotlight's focus are under way in earnest. (*ASR* #22, page 3).

ASR has, as planned, provided an invaluable source of authorative information to bulletin stations around the world. Stories originated in *ASR* are reprinted in the amateur and professional media with gratifying regularity. *ASR* has become in fact the reliable "source" that was intended.

ASR has provided regular snapshots on the organization; it has caught the beast mid-stride. Significantly, it has provided the detailed news coverage that will be archived for a few years but will ultimately be called upon by those who one day will seek to research the most ambitious of amateur radio activiites; the juncture of amateur radio, personal computers, participatory science and amateurs in space.

Regretably, the success of *ASR* has brought into question the role of AMSAT's flagship publication *ORBIT*. Some have suggested that it be retired in favor of *ASR* as the journal of AMSAT. The editors have emphasized the fundamental differences in the roles of each publication and their respective abilities to successfully fulfill those roles. They have cautioned against converting the chagrin with *ORBIT's* present irregularity into a move to dispense with it altogether in favor of *ASR*. The editors point out that the role of *ORBIT* in providing the technical articles in depth, regular columns by K2ZRO, G3IOR, Falworth, etc., cannot be accomplished in a newsletter format. Moreover, they say that the economics of production precludes it as well. At $18 ($26 overseas) per annum, *ASR* costs more than the present annual membership to AMSAT ($16). Thus *ASR's* readership is limited. It will continue to be so because the subscription cost is not small for a source of information; unless of course the reader finds the information invaluable. Several hundred around the world apparently do! *ORBIT's* irreplaceable role in advancing AMSAT's objectives will be manifestly evident, the editors suggest, once the Phase III growth curve has begun later this year. Finally, the editors point to the recent hiring of K1FM as *ORBIT* Editor as proof of the organization's resolve to improve *ORBIT's* timeliness following the departure of G3ZCZ last summer. With K1FM as *ORBIT* Editor and WA2LQQ assuming the new position of Editor-In-Chief (a largely supervisory role dealing with publication strategy, information dissemination and policy) members may look forward to an improved product. Thus readers of both *ORBIT* and *ASR* will benefit in ways that are self-evident.

ASR has covered some interesting stories in its first year. In the space domain proper we have reported the launch of UoSAT OSCAR 9, Radio 3, 4, 5, 6, 7 and 8; the death of AMSAT-OSCAR 7 and the rebirth of RS-1 (2?). In more personal terms we have shared the joys in the arrival of Nadia Marie King (harmonic of W3GEY) and have together grieved at the loss of G2BVN and W6DOW. Tech Briefs have sought to convey a glimpse of orbital insight and a fundamental understanding of UoSAT's radiation counters and propagation experiments. On the other hand, our inability to play it all straight was demonstrated in "Geriornithopathology" (*ASR* #12). On a similar note the Dayton Hamvention coverage included a healthy influence of the muse. (*ASR* #7). In near-breathless enthusiasm we covered the successful launch of Ariane LO3 and the ALINS which accompanied the event. *ASR* even had a contest or two. First was the T-Shirt Limerick Contest. Then followed the "What in the ...is W3GEY doing" contest. Then of course we had the "Ooops" (*ASR* #5). And who could forget "Ooops" (*ASR* #8 and 19). And then of course we had "Errata" (*ASR* #18). We mention these fine articles in case the reader begins to believe as we, i.e., that we never make missteakes!

In looking ahead we see more of the same that brought us this far. We plan to add a few new names to the mast and to try a few new regular features. For example, this issue we begin Phase III Countdown as a regular feature. As readership grows we hope to be able to include some special giveaways and premiums that will further endear us to your hearts (only to the extent that our zero-base budget will allow, of course!!!) Our goal for our second year is to double our present readership. That is, we want to be at the 1000 level one year from now. With that as our goal and our dedicated AMSAT readers behind us, that seems a modest objective indeed! Thanks for being with us to here.

AMSAT Stickers Slated For Spring

Beginning in early April AMSAT will be offering distinctive bumper stickers in exchange for a small donation. The colorful stickers will show the Phase IIIB bird in its new regalia including the brand new antenna configuration for the L transponder as well as the Mode B transponder. The stickers will be suitable to adhere to attache cases, shack walls, and virtually any place you wish. The price and availability will be announced at a later date.

Phase III Countdown: A Systems Overview

The concept of the Phase III Countdown newsletter originated prior to the planned launch of Phase IIIA, 23 May 80. Pat Gowen, G3IOR, AMSAT Director and European Regional Coordinator, issued the Phase III Countdown letter to members of the IARU to keep them informed on the progress of activities leading to the actual launch. With the advent of *ASR* we have a natural vehicle for the Countdown idea. Thus, last summer AMSAT decided to continue the Phase III Countdown concept in the new package, *ASR*. This is the first in the series which by launch day will present as much material as possible that will be of use to the builder of Phase III-compatible stations, those who would become users of the Phase III resources and those who would write about Phase III for other groups of interested amateurs and non-hams.

We begin the series with an overview of the various systems and considerations that will affect Phase IIIB operations and especially how the user will see the new spacecraft. In this overview we will speak in generalities. Specifics and details will follow in subsequent installments.

Launch day is scheduled for 6 July 82. The launch vehicle will be a three stage rocket of the European Space Agency (ESA) called Ariane. There have been three successful launches of Ariane and one failure. The second test launch exploded on launch 23 May 80 and destroyed the Phase IIIA bird. The fifth launch of Ariane and the first operational launch, L5, is scheduled for early Spring. AMSAT's Phase IIIB spacecraft is manifested for L6 due to be launched 6 July 82. The ESA launch facility is located at Kourou, French Guiana, South America. The site was chosen so as to be close to the Equator to increase the weight that could be placed into geosynchronous orbit.

The Phase IIIB spacecraft will weigh nearly 150 kg (365 lbs) and will be in the three pointed star configuration similar to Phase IIIA. This configuration was chosen to maximize surface area for solar cells to improve the electric power budget. Much of the hardware will be the same as was developed for Phase IIIA but with some significant enhancements. Phase IIIB will carry, in addition to the Mode B transponder with uplink at 70 cm and downlink at 2 meters, an L-transponder called for the present, Mode X. Mode X will have an uplink at 23 cm and a downlink at 70 cm. The antennas for the transponders will be circularly polarized with substantial gain. Required uplink power for Mode B is estimated (pending systems calibration) to be about 500 to 1000 watts ERP and on Mode X about 1 - 2 kw ERP is estimated.

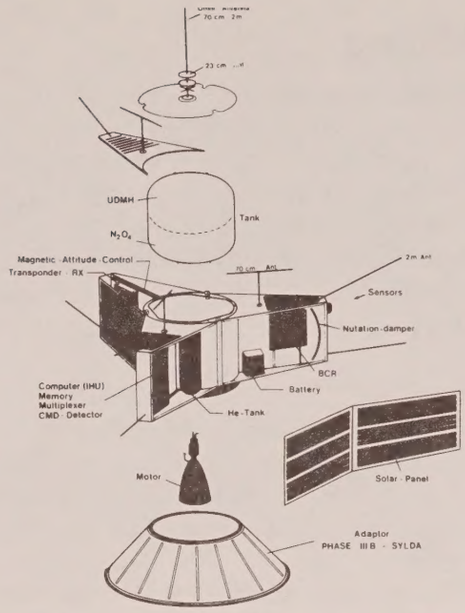
The orbit for Phase IIIB will be very similar to that planned for Phase IIIA except for some minor details. The orbit will be a high elliptical orbit known as a Molniya orbit. It is hoped that the inclination will reach 60 degrees or so with a 10.5 hour period. The apogee will be about 40,000 km with the final perigee around 1500 km. The ground track resulting will take some getting used to and present satellite locator systems will prove useless. Computer generated plots and specially designed manual locator systems will be required. The coverage of the satellite will be great allowing nearly hemispheric coverage at times. The satellite will reach its final orbit only after a maneuver following separation from the launch cannister called the SYLDA. The energy to perform the maneuver will be provided by a liquid fueled rocket engine (kick motor) fueled by a mixture of UMDH and nitrogen tetroxide. The maneuver burn will last but a few seconds but will palce the satellite in a long-lived orbit better able to serve the amateur community.

The passband of the Mode X transponder will be 800 kHz wide and that of the Mode B transponder will be 150 kHz wide. A bandplan for each mode is presently being devised. Public discussion of the proposed bandplan will be promoted in this column as well as elsewhere. Current planning envisions partitioning the passbands into three broad zones as before with one third each for cw, ssb and mixed cw/ssb. As with Phase IIIA, there is consideration being given to the incluson of the special service channels (SSCs) for the communication of special activities such as packet radio, bulletins, etc. There are 4 SSCs being considered for Phase IIIB rather than the 6 envisioned for Phase IIIA.

Ground command stations for Phase IIIB will be located in the U.S., New Zealand and Germany at least. Others may be added as mission requirements demand. Telemetry from the satellite will be bi-phase DPSK at 400 bps.

The ARRL has ruled that the satellite endorsement to the DXCC award may not be obtained for high orbit satellites such as Phase IIIB because, in essence, it will be too easy.

The user community on Mode B is expected to grow very quickly. Emphasis on communications discipline will be stressed. When the Mode B transponder begins to become overloaded, the operational plan is to begin a gradual increase in the proportion of time the Mode X transponder will be on compared to that time when the Mode B will be on. Both transponders will not be simultaneously operated. The hope is



that the congestion expected on Mode B will be relieved by Mode X. There, with 800 kHz and more of a technical challenge, the congestion will likely not occur for years if at all.

Phase IIIB will cost several hundred thousand dollars once all the bills are in and the volunteer labor value is factored in. A comparable commerical project would cost in the millions. AMSAT's paid staff of engineers and scientists number less than a dozen. Volunteers pick up the slack and number in the dozens. Direct support for Phase III in terms of flight hardware and money to build the spacecraft has come from many national radio societies and from hundreds of individuals around the world.

On board the Phase IIIB spacecraft will be an extremely sophisticated computer called the Integrated Housekeeping Unit (IHU). As the name implies, the IHU will supervise the performance of such critical functions as timing precisely the firing of the kick motor and such routine tasks as telemetry formatting. The IHU will control the attitude of the spacecraft by first determining the orientation and spin rate by looking for the sun and the earth through special optical devices (remarkably aptly named sun-sensor and earth-sensor). At precisely timed intervals the IHU will energize electromagnets in the "arms" of the spacecraft. The interaction of the geomagnetic field and the spacecraft's field results in a torque (twisting force) which will orient the spacecraft in the desired direction. Periodically the IHU will check to see if the alignment needs refining and act accordingly.

Phase IIIB should continue operation well into the second half of this decade. To reach this reliability goal special design features have been incorporated such as radiation shielding to protect the integrated circuits from radiation damage (to extend their expected life). The thermal design of the spacecraft is the result of a complex computer model developed by a professional spacecraft designer. All previous known failures of amateur spacecraft have occurred due to battery failure. Phase IIIB will be the first to carry a back-up, spare battery to extend the spacecraft life beyond that realizeable with a single battery. This back-up battery concept is used in commercial and military satellites to achieve the same objective. The spacecraft is built of space-qualified hardware subjected to the most rigorous of testing and burn-in. The entire spacecraft will be tested at the Goddard Space Flight Center in a thermal-vacuum chamber to evaluate its performance in a simulated space environment. The spacecraft will be evaluated for balance under spin conditions and vibrated to look for mechanical resonances.

When placed in orbit this summer, Phase IIIB will likely become one of the most significant influences to affect amateur radio ever. The impact on the course of events is likely to be so great as to be essentially unpredictable beyond, say, a few years. What can be stated with relative certainty, however, is that amateur radio will never again be the same!

In this first episode of Phase III Countdown we have looked at some of the factors which will make the Phase IIIB the splendid achievement it bodes to be. We have seen how amateurs around the world have united in a grand dream of technological innovation stirring the imagination of operator and technician alike. We have looked at some of the physical characteristics of the bird and viewed some of ther performance values. And we have hinted at some of the organizational challenges that lie ahead in keeping under rein the diverse, powerful forces which, on the one hand, could work for immense benefit; on the other, to the grievous detriment of the program for years to come. In future episodes of Phase III countdown we will examine in somewhat greater detail the topics we sketched out here in this first installment. Stay tuned!

RS-3/4 News

Reliable sources in Europe in a position to know have again denied the existance of any transponder aboard Radio 3. Nothing was said by way of denial of a robot on 3 or any mention at all regarding what is on Radio 4. Against this background we have the report of UA3AV as relayed by W3HV that late April is a fertile time for new things to spring from the Radio Sputniks. Specifically, W3HV quotes UA3AV as hinting that Lenin Day (22 April) or May Day (1 May) would be likely days to watch for new developments.

The Russians are often predisposed to the commemoration of politically significant historical events with figurative fireworks of one kind or another. What will this Spring bode? Those who are in a position to know are keeping mum. There is, however, no dirth of auxiliary events from which to draw real or imagined connections. There is the 13 cm satellite mentioned in *ASR* #26 for one. Then there are the unexplained 70 cm space-originated signals heard on 433.1 MHz. Finally there is the intriguing possibility that one or more of the Radio satellites is involved in a multi-nation program called SARSAT.

SARSAT (Search and Rescue Satellite Aided Tracking) is a joint project of the Canadian Department of Communications (DOC), the Centre National d'Etudes Spatiales of France (CNES), NASA (the U.S. National Aeronautics and Space Administration). *ASR* has learned of a strong Russian participation in SARSAT. A recent story detailing the SARSAT program appeared in the U.S. magazine, *Signal*, which is the journal of the Armed Forces Communications and Electronics Association (AFCEA). In the January 82 issue of *Signal* it is mentioned that: "Canada and the United States have been investigating the application of satellite technology to the SAR problem. Experiments using the AMSAT-OSCAR satellites during 1975 and 1976 demonstrated the validity of the proposed SARSAT system design."

AMSAT officials in Washington expressed satisfaction in having the experiments in 75-76 provide a benchmark or proof of concept for the present SARSAT proposal but were unsure if the SARSAT had any connection with the Radio 3/4 puzzle or the UA3AV hints of things to come.

Suspect Cuban Control Station

Observations of Radio satellite mode changes while the birds were over the south Atlantic have led to speculation that a Cuban command station may have been put into operation recently. WØCA/4 and W4EWB, both in Florida, report that the telemetry channel "K" of RS-65 was sending "00" at AOS at 1400 UTC, 6 Feb. Then at about 1406 or 1407 WØCA heard non-zero values from channel "K" and the robot in action. At 1407 RS-5 was just crossing the Mexican coast on a course northeast towards the U.S. and just passing over the Caribbean. It would have been a very easy shot from anywhere in Cuba with elevation angles from western Cuba of greater than 35 degrees. On the other hand, AOS from Moscow on that orbit would not have occurred until at least 1420 or 1421 UTC so there was no way they could have intervened from the USSR.

There is the possibility of an on-board timer which caused the change but this seems unlikely. Moreover, *ASR* had suspected that additional control stations would be instituted around the world to support the Radio Sputnik's operation. Command station operation from Siberia is imminent we are told. Speculation regarding possible other command QTHs continues meanwhile.

Radio 5 Appears Suddenly

The transponder aboard Radio 5 began regular operations the week of 8 Feb. with many stations reporting contacts through the bird. The robot on Radio 5 had been on regularly but the transponder had been off since early in the spacecraft's life after testing was complete. The reason for the change in operating agenda is likely given in the *Sovetski Patriot* article quoted in *ASR* #26 where it was pointed out that since 5 and 6 shared a common frequency band, they would not be on simultaneously if they had the same radio visibility zone; coverage area. The week of 8 Feb. saw Radio 5 and 6 separated by sufficient space, apparently, that the controllers decided to activate Radio 5's transponder. However, on Sunday, 14 Feb., reports from Europe indicated that 5 had again been deactivated. Again the reason seems to be one of avoidance of co-interference and the promotion of orderly operations.

AMSAT-OSCAR 8 Celebrates Fourth Year

On 5 Mar. 82 AO-8 will be four years old. To commemorate the event the ARRL has announced a program to be run during the month of March. Any station that sends a copy of AO-8 telemetry covering the period 1 -31 Mar. to ARRL with a SASE will receive a handsome AMSAT-OSCAR 8 QSL card. In addition, any station that accomplishes a QSO through AO-8 and sends details of the QSO together with a 13cm by 18cm (5" X 7") or larger SASE will receive a glossy black and white photograph of AO-8. Send to ARRL, 225 Main St., Newington, CT 06111. Mark your mail to the attention of Club and Training Department, AO-8 Fourth Anniv. If you don't have U.S. stamps, send sufficient IRCs.

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